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# LAB 08

# POLYMORPHISM, ABSTRACT CLASSES AND FINAL KEYWORD

EXERCISE 1

As a logic building learner you are given the task to extract the string which has vowel as the first and last characters from the given array of Strings.

Step1: Scan through the array of Strings, extract the Strings with first and last characters as vowels; these strings should be concatenated.

Step2: Convert the concatenated string to lowercase and return it.

If none of the strings in the array has first and last character as vowel, then return no matches found

input1: an integer representing the number of elements in the array.

input2: String array.

Example 1:

input1: 3

input2: {“oreo”, “sirish”, “apple”}

output: oreoapple

Example 2:

input1: 2

input2: {“Mango”, “banana”}

output: no matches found

Explanation:

None of the strings has first and last character as vowel.

Hence the output is no matches found.

Example 3:

input1: 3

input2: {“Ate”, “Ace”, “Girl”}

output: ateace

**For example:**

| **Input** | **Result** |
| --- | --- |
| 3  oreo sirish apple | oreoapple |
| 2  Mango banana | no matches found |
| 3  Ate Ace Girl | ateace |

Answer:

import java.util.\*;

public class deep

{

public static void main(String[] args)

{

Scanner sc=new Scanner(System.in);

int n=sc.nextInt();

int d=0;

String arr[]=new String[n];

for(int i=0;i<n;i++)

{

arr[i]=sc.next();

arr[i]=arr[i].toLowerCase();

char ch=arr[i].charAt(0);

if(ch=='a'||ch=='e'||ch=='i'||ch=='o'||ch=='u')

{

int z=arr[i].length();

char y=arr[i].charAt(z-1);

if(y=='a'||y=='e'||y=='i'|y=='o'||y=='u')

{

d=1;

System.out.print(arr[i]);

}

}

}

if(d==0)

{

System.out.println("no matches found");

}

}

}

|  | **Input** | **Expected** | **Got** |  |
| --- | --- | --- | --- | --- |
|  | 3  oreo sirish apple | oreoapple | oreoapple |  |
|  | 2  Mango banana | no matches found | no matches found |  |
|  | 3  Ate Ace Girl | ateace | ateace |  |

EXERCISE 2

### 1. Final Variable:

* Once a variable is declared final, its value cannot be changed after it is initialized.
* It must be initialized when it is declared or in the constructor if it's not initialized at declaration.
* It can be used to define constants

final int MAX\_SPEED = 120; // Constant value, cannot be changed

### 2. Final Method:

* A method declared final cannot be overridden by subclasses.
* It is used to prevent modification of the method's behavior in derived classes.

public final void display() {  
 System.out.println("This is a final method.");  
}

### 3. Final Class:

* A class declared as final cannot be subclassed (i.e., no other class can inherit from it).
* It is used to prevent a class from being extended and modified.
* public final class Vehicle {  
   // class code  
  }

Given a Java Program that contains the bug in it, your task is to clear the bug to the output.

you should delete any piece of code.

**For example:**

| **Test** | **Result** |
| --- | --- |
| 1 | The maximum speed is: 120 km/h  This is a subclass of FinalExample. |

Answer:

class FinalExample {

// Final variable

int maxSpeed = 120;

// Final method

public final void displayMaxSpeed() {

System.out.println("The maximum speed is: " + maxSpeed + " km/h");

}

}

class SubClass extends FinalExample {

// You can create new methods here

public void showDetails() {

System.out.println("This is a subclass of FinalExample.");

}

}

class prog {

public static void main(String[] args) {

FinalExample obj = new FinalExample();

obj.displayMaxSpeed();

SubClass subObj = new SubClass();

subObj.showDetails();

}

}

|  | **Test** | **Expected** | **Got** |  |
| --- | --- | --- | --- | --- |
|  | 1 | The maximum speed is: 120 km/h  This is a subclass of FinalExample. | The maximum speed is: 120 km/h  This is a subclass of FinalExample. |  |

EXERCISE 3

Create a base class Shape with a method called calculateArea(). Create three subclasses: Circle, Rectangle, and Triangle. Override the calculateArea() method in each subclass to calculate and return the shape's area.

In the given exercise, here is a simple diagram illustrating polymorphism implementation:



abstract class Shape {  
 public abstract double calculateArea() ;  
 }  
}

System.out.printf("Area of a Triangle :%.2f%n",((0.5)\*base\*height)); // use this statement

sample Input :

4 // radius of the circle to calculate area PI\*r\*r

5 // length of the rectangle

6 // breadth of the rectangle to calculate the area of a rectangle

4 // base of the triangle

3 // height of the triangle

OUTPUT:

Area of a circle :50.27  
Area of a Rectangle :30.00  
Area of a Triangle :6.00

**For example:**

| **Test** | **Input** | **Result** |
| --- | --- | --- |
| 1 | 4  5  6  4  3 | Area of a circle: 50.27  Area of a Rectangle: 30.00  Area of a Triangle: 6.00 |
| 2 | 7  4.5  6.5  2.4  3.6 | Area of a circle: 153.94  Area of a Rectangle: 29.25  Area of a Triangle: 4.32 |

Answer:

import java.util.\*;

abstract class y

{

public abstract double calculateArea();

}

class c extends y

{

double x;

c(double x)

{

this.x=x;

}

public double calculateArea()

{

double a=Math.PI\*x\*x;

System.out.printf("Area of a circle: %.2f\n",a);

return a;

}

}

class x extends y

{

double l;

double b;

x(double l,double b)

{

this.l=l;

this.b=b;

}

public double calculateArea()

{

double a=l\*b;

System.out.printf("Area of a Rectangle: %.2f\n",a);

return a;

}

}

class t extends y

{

double b;

double h;

t(double b,double h)

{

this.b=b;

this.h=h;

}

public double calculateArea()

{

double a=b\*h\*0.5;

System.out.printf("Area of a Triangle: %.2f\n",a);

return a;

}

}

public class hello

{

public static void main(String[] args)

{

Scanner sc=new Scanner(System.in);

double x1=sc.nextDouble();

c c1=new c(x1);

double l1=sc.nextDouble();

double b1=sc.nextDouble();

x x2=new x(l1,b1);

double b2=sc.nextDouble();

double h2=sc.nextDouble();

t t1=new t(b2,h2);

c1.calculateArea();

x2.calculateArea();

t1.calculateArea();

}

}

|  | **Test** | **Input** | **Expected** | **Got** |  |
| --- | --- | --- | --- | --- | --- |
|  | 1 | 4  5  6  4  3 | Area of a circle: 50.27  Area of a Rectangle: 30.00  Area of a Triangle: 6.00 | Area of a circle: 50.27  Area of a Rectangle: 30.00  Area of a Triangle: 6.00 |  |
|  | 2 | 7  4.5  6.5  2.4  3.6 | Area of a circle: 153.94  Area of a Rectangle: 29.25  Area of a Triangle: 4.32 | Area of a circle: 153.94  Area of a Rectangle: 29.25  Area of a Triangle: 4.32 |  |